LIBRI BOTANICI

Vol. 17

A Monograph of *Marasmius*, *Collybia* and related genera in Europe.

Part 2: *Collybia*, *Gymnopus*, *Rhodocollybia*, *Crinipellis*, *Chaetocalathus*, and additions to *Marasmiellus*.

by

Vladimír Antonín and
Machiel E. Noordeloos

With 52 figures
and 46 coloured plates

IHW-VERLAG
1997

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

Antonín, Vladimír:
A monograph of Marasmius, Collybia, and related genera in Europe / by Vladimír Antonín and Machiel E. Noordeloos. - Eching : IHW-Verl.

Pt. 2. Collybia, Gymnopus, Rhodocollybia, Crinipellis, Chaetocalathus, and additions to Marasmiellus. - 1997
(Libri botanici ; Vol. 17)
ISBN 3-930167-25-5

Impressum:

ISBN 3-930167-25-5

Authors: Dr. Vladimír Antonín
Moravian Museum
Department of Botany
Zelny trh 6
CS - 65937 Brno

Dr. Machiel E. Noordeloos
Rijksherbarium - Hortus Botanicus
Van Steenisgebouw, Einsteinweg 2
P.O. Box 9514
NL - 2300 RA Leiden

Production: Berchtesgadener Anzeiger
Griesstätter Str. 1
D - 83471 Berchtesgaden

Publication: IHW-Verlag & Verlagsbuchhandlung
Postfach 1119
D - 85378 Eching bei München

Telefax: nat. 089-3192257
internat. +49-89-3192257

4.3. KEY TO THE GENERA OF COLLYBIOID AND MARASMOID FUNGI IN EUROPE

1. Pileipellis a true hymeniderm *Marasmius*
1. Pileipellis a true hymeniderm only in primordial state or otherwise 2.
2. Stipe insititious 3.
2. Stipe pseudoinsititious or with basal mycelium 6.
3. Pileus (and often also stipe) with long, setiform hairs, that are often thick-walled 4.
3. Pileipellis lacking such hairs 5.
4. Basidiocarps marasmoid or collybioid with centrally inserted stipe *Crinipellis*
4. Basidiocarps pleurotoid with laterally attached stipe *Chaetocalathus*
5. Pileipellis sometimes initially hymeniform, but later on becoming an irregular trichoderm, made up of diverticulate hyphae, mixed with broom cells; hyphae of apex of stipe dextrinoid *Setulipes*
5. Pileipellis a cutis from the beginning, sometimes with transitions to a trichoderm, typically composed of diverticulate hyphae, sometimes with a Ramealis-structure, rarely with only a few projections, (almost) smooth; hyphae never dextrinoid *Marasmiellus*
6. Spore deposit pink to orange tinted when fresh; spores usually dextrinoid and cyanophilous; pileipellis a cutis or ixocutis of smooth hyphae *Rhodocollybia*
6. Spore deposit white to cream-coloured; spores never dextrinoid or cyanophilous; pileipellis composed of smooth to irregular or divertiulate hyphae 7.
7. Pileipellis a cutis or ixocutis of narrow, cylindrical hyphae, without projections or diverticulate endings, lacking encrusting pigment; basidiocarps small, often growing from a sclerotium in or round mummified remnants of Basidiomycetes *Collybia*
7. Pileipellis a cutis or trichoderm, made up of hyphae with few to numerous projections, or with lobed to diverticulate terminal elements, frequently with encrusting pigments; basidiomata growing on other substrata, or rarely originating from a sclerotium *Gymnopus*

5.1. COLLYBIA (Fr.) Staude

Agaricus trib. *Collybia* Fr., Syst. mycol. 1: 129. 1821; *Collybia* (Fr.) Staude, Schwämme Mitteldeutschl.: 119. 1857. Syn.: *Microcollybia* Métrod ex Lennox, Mycotaxon 9: 187. 1979.

Type species: *Collybia tuberosa* (Bull.: Fr.) Kummer

Section Collybia

Syn.: *Collybia*, sect. *Cirrhatae* Sing., Ann. mycol. 41: 111. 1943.

Type species: *Collybia tuberosa* (Bull.: Fr.) Kummer

Basidiocarps small; pileus up to 20 mm, generally white or pale yellow, brown or grey, membranaceous, convex to applanate with shallow depression or weakly umbonate, often radially wrinkled, with involute then deflexed or straight margin; lamellae crowded, narrowly adnate, sometimes with short decurrent tooth, white to fairly dark greyish brown or rarely chocolate brown; stipe filiform, often originating from a small sclerotium, or deeply rooting in substrate, pruinose, at least in lower half, often hairy at base, rarely with short side-branches bearing abortive pilei that produce conidia.

Spores small, less than 7 µm long, ellipsoid; lamella edge fertile or heterogeneous; cheilocystidia if ever present, then inconspicuous and shaped like basidioles, hardly protruding from hymenium; pileipellis an (ixo)cutis of smooth, cylindrical hyphae frequently embedded in a hyaline gelatinous matrix; pigment, if present, pale, intracellular; clamp-connections abundant.

Chemical reactions: Hyphae of stipitipellis not dextrinoid; according to LENNOX (1979), negative with all other tested reagents.

Ecology: Saprotrophic, gregarious on and around black, mummified remnants of fleshy basidiocarps in forests.

Distribution: Rare but widely recorded from the boreal and temperate regions of Europe and North America.

Phenology: August - October

Collections examined:

AUSTRIA: Niederösterreich, Bad Fischau, 16 Oct. 1983, Kürassier (WU). **CZECH REPUBLIC:** Třeboň, „U Jindrů", 20 Aug. 1959, J. Kubička 651/59 (PRM). **ITALY:** Ravenna, Lido di Dante, 14 Nov. 1991, A. Hausknecht (WU). **NETHERLANDS:** prov. Overijssel, 1929, W. J. Lütjeharms (L); prov. Noord Brabant, Valkenswaard, 20 Aug. 1948, J. Daams (L).

Notes: *Collybia racemosa* is easily recognized by the branched stipe with abortive pilei producing conidia, the relatively dark lamellae and the black (sub)globose sclerotium. The production of conidiophores makes this taxon an unique species in European collybioid genera.

5.2. GYMNOPUS (Pers.) Roussel, Fl. Calvados, 2nd ed.: 62. 1806.

Selected literature: Clémençon, Z. Mykol. 47: 5-25. 1987; Halling, Gen. *Collybia*. Mycol. Mem. 8. 1983; Jansen, *Collybia*. in Wetensch. Meded. K. N. N. V. 205. 1991; Noordeloos in Bas & al., Flora agaricina neerlandica 3: 106-123. 1995.

Basidiocarps collybioid, rarely tricholomatoid; pileus convex, plano-convex to applanate or slightly concave, with or without umbo or papilla, hygrophanous or not, translucently striate or not, dry or slightly viscid, glabrous or innately radially fibrillose; lamellae free, emarginate or adnate, usually crowded, sometimes fairly distant, linear, segmentiform or ventricose with entire or serrate edge; stipe central, cylindrical, sometimes broadened towards base, rarely deeply rooting or arising from a sclerotium, tough and firm, solid or fistulose; base usually strigose; spore print white.

Spores ellipsoid to oblong, rarely subglobose to globose or lacrymoid, thin-walled, hyaline, non-amyloid, with confluent or well-delimitated hilar appendage; basidia 4-spored, clamped; cheilocystidia usually present, cylindrical, flexuous, clavate or irregularly coralloid, thin-walled, never as broom-cells; pleurocystidia absent or in a few species rare and inconspicuous; pileipellis a cutis or ixocutis of radially orientated cylindrical hyphae, or interwoven, more like a trichoderm, made up of irregular coralloid terminal elements (Dryophila-structure), never a Rameales-structure; hymenophoral trama regular to subregular; pileitrama irregular; clamp-connections present in all tissues.

Ecology: Saprophytic, rarely parasitic; in humus, on wood, rarely on roots of dead, rarely living herbaceous and woody plants.

Distribution: Cosmopolitan.

Sectional delimitation: Traditionally *Collybia* s.l. has been divided into sections based on characters of the stipe-surface (FRIES, and 19th century authors), and later on, supplemented by characters of the pileipellis. In the most recent classifications of SINGER (1976), HALLING (1983), KÜHNER (1980) and JANSEN (1991) the major sections are:

Sect. Striipedes: Stipe surface strongly fibrillose-grooved; pileipellis a Dryophila-structure
Sect. Vestipedes: Stipe surface hairy or tomentose; pileipellis a simple cutis without Rameales- or Dryophila-structure
Sect. Levipedes: Stipe smooth, polished; pileipellis a Dryophila-structure
Sect. Subfumosae: Characters as in *Vestipedes* but pileipellis a sort of Rameales-structure.

In his extensive discussion on the sections in *Collybia*, KÜHNER (1980) made clear that sect. *Levipedes* in the emended concept of SINGER (1975) had nothing to do with the original section of FRIES (1854). By restricting the principal character of this section to the presence of a Dryophila-structure in the pileipellis, SINGER brought together in one section species with both a smooth and a pruinose to hairy stipe surface. On the contrary, SINGER (l.c.) also transferred species from sect. *Vestipedes* to sect. *Levipedes* if they had this typical Dryophila-structure. In both sections species were brought together that had been classified by FRIES (1854 and later) in both the genus *Collybia* and *Marasmius*. KÜHNER (1980) made also very clear that there had to be new criteria for the delimitation of genera and subgeneric taxa in the *Marasmius/Collybia* complex.

During our studies in marasmoid and collybioid fungi, the pileipellis structure of all European taxa was studied closely, and compared with the results of the work of HALLING (1983) and JANSEN (1991). From this study it became clear that there is a much broader variation in pileipellis structures in *Collybia* sensu lato than appears from literature. In particular the limits are vague between the Dryophila-structure with irregularly arranged, strongly inflated, jig-saw puzzle-like structures, and a pileipellis with diverticulate hyphae or so-called Rameales-structure. Furthermore, the species from section *Vestipedes*, like *G. confluens* do not have a simple cutis of radially arranged, cylindrical hyphae, but frequently also coralloid or diverticulate terminal elements. Therefore the delimitation between the sections as indicated has to be reconsidered. A first step would be to fuse sections *Vestipedes* and *Subfumosae*, including the incorporation of some former *Micromphale* spp. with non-insititious stipe and with distinct basal mycelium in *Gymnopus*. But what to do with taxa with smooth stipe, but lacking a typical Dryophila-structure? These cannot be accommodated in sect. *Levipedes* in its current concept, and do not fit either in *Vestipedes* or *Subfumosae*. Then, on the other hand, some taxa very similar to *G. dryophila*, such as *G. nivalis*, and *G. alpinus*, both with smooth stipe, have a less distinct Dryophila-structure. In *G. nivalis* we find specimens with a well-developed Dryophila-structure as well as specimens with a poorly developed Dryophila-structure in one and the same collection. On the other hand, *Gymnopus benoistii*, with a densely pruinose stipe, has a very distinct Dryophila-structure. Thus we would suggest that the current sectional concepts need revision. We propose here a new delimitation based on other character combinations. To avoid nomenclatoral confusion, we refrain from creating new sectional names, but propose the emendation of old sectional names like *Vestipedes* and *Levipedes*, adding a few new subgeneric taxa.

Key to the sections in Europe

1. Basidiocarps rather robust with fleshy pileus and strongly fibrillose-costate stipe with rooting base; pileipellis an entangled trichoderm of the Dryophila-type — Sect. *Gymnopus*
1. Basidiocarps small to medium-sized with membranaceous or thin-fleshed pileus; stipe never grooved **and** rooting; pileipellis of the Dryophila-type or not — 2.
2. Smell strong, fetid or like onions; cheilocystidia, if present, rather inconspicuous; pileipellis with coralloid or diverticulate terminal elements — Sect. *Vestipedes* subsect. *Impudicae*
2. Smell indistinct — 3.
3. Pileipellis usually a simple cutis with some weakly to distinctly coralloid or diverticulate terminal elements; lamellae edge usually sterile with well-differentiated cheilocystidia — Sect. *Vestipedes* subsect. *Vestipedes*
3. Pileipellis an entangled, not radially oriented trichoderm of inflated, often lobed or coralloid elements of the Dryophila-type — 4.
4. Lamella edge usually sterile with well-differentiated cheilocystidia; hyphal walls or encrustations only rarely turning green in alkali — Sect. *Levipedes* subsect. *Levipedes*
4. Lamella edge fertile or with scattered, inconspicuous cheilocystidia; hyphal walls and often also encrustations, turning green in alkali — Sect. *Levipedes* subsect. *Alkalivirentes*

Synopsis of the European species

Sect. *Gymnopus*

1. *Gymnopus fusipes* (Bull.: Fr.) S. F. Gray

Sect. *Vestipedes* subsect. *Vestipedes*

2. *Gymnopus confluens* (Pers.: Fr.) Antonín, Halling & Noordel.
3. *Gymnopus peronatus* (Bolt.: Fr.) Antonín, Halling & Noordel.
4. *Gymnopus inodorus* (Pat.) Antonín & Noordel.
5. *Gymnopus luxurians* (Peck) Murrill
6. *Gymnopus terginus* (Fr.) Antonín & Noordel.
7. *Gymnopus moseri* Antonín & Noordel.
8. *Gymnopus huijsmanii* Antonín & Noordel.
9. *Gymnopus putillus* (Fr.: Fr.) Antonín, Halling & Noordel.
10. *Gymnopus acervatus* (Fr.) Murrill
11. *Gymnopus oreadoides* (Passer.) Antonín & Noordel.

12a. *Gymnopus nivalis* (Luthi & Plomb) Antonín & Noordel.

12b. *Gymnopus nivalis* (Luthi & Plomb) Antonín & Noordel. var. *pallidus* Antonín & Noordel.

Sect. *Vestipedes* subsect. *Impudicae*

13. *Gymnopus impudicus* (Fr.) Antonín, Halling & Noordel.
14. *Gymnopus graveolens* (Poirault ex Boudier) Antonín & Noordel.
15. *Gymnopus herinkii* Antonín & Noordel.

16a. *Gymnopus brassicolens* (Romagn.) Antonín & Noordel. var. *brassicolens*

16b. *Gymnopus brassicolens* (Romagn.) Antonín & Noordel. var. *pallidus* Antonín & Noordel.

17. *Gymnopus hariolorum* (Bull.: Fr.) Antonín, Halling & Noordel.

Sect. *Levipedes* subsect. *Levipedes*

18. *Gymnopus dryophilus* (Bull.: Fr.) Murrill
19. *Gymnopus ocior* (Pers.) Antonín & Noordel.
20. *Gymnopus aquosus* (Bull.: Fr.) Antonín & Noordel.
21. *Gymnopus alpinus* (Vilgalys & Miller) Antonín & Noordel.
22. *Gymnopus benoistii* (Boud.) Antonín & Noordel.
23. *Gymnopus hybridus* (Kühn. & Romagn.) Antonín & Noordel.
24. *Gymnopus erythropus* (Pers.: Fr.) Antonín, Halling & Noordel.
25. *Gymnopus fagiphilus* (Velen.) Antonín, Halling & Noordel.

Sect. *Levipedes* subsect. *Alkalivirentes*

26. *Gymnopus fuscopurpureus* (Pers.: Fr.) Antonín, Halling & Noordel.
27. *Gymnopus loiseleurietorum* (Moser, Gerholt & Tobies) Antonín & Noordel.

KEY TO THE SPECIES IN EUROPE

1. Stipe 50-110(-160) x 8-20 mm, red-brown, fusiform or irregularly compressed, strongly fibrillose-costate, tapering towards a deeply rooting base **1. G. fusipes**
1. Stipe different 2.
2. Smell strong, unpleasant, reminiscent of rotten cabbage, sewage, onions or garlic 3.
2. Smell indistinct 10.
3. Pileus pink, clay-pink, ochraceous-pink, pale (pinkish) brown, strongly pallescent on drying; lamellae often rather crowded 4.

3. Pileus and stipe darker; lamellae moderately distant to very distant 5.
4. Stipe white at apex, pale brown below **17. G. hariolorum**
4. Stipe purplish-blue **Collybia pyrenaica**, see chapter 6
5. Stipe ochre-brown, originating from a small sclerotium **14. G. graveolens**
5. Stipe darker, not originating from a sclerotium 6.
6. Cheilocystidia absent **15. G. herinkii**
6. Cheilocystidia present, well-differentiated 7.
7. Stipe glabrous, polished, at least in most of its length compare **24. G. erythropus**
7. Stipe pruinose to hairy 8.
8. Pileus not translucently striate or at margin only, subtomentose on drying; lamellae tinged brown from the beginning; stipe pruinose, whitish when dry, glabrescent with age **13. G. impudicus**
8. Pileus translucently striate at least up to half the radius, glabrous; lamellae white at first, stipe pruinose to hairy, dark when dry 9.
9. Pileus dark red-brown or yellow-brown, pallescent to incarnate-brown or ochre-brown; on leaves and branchlets of deciduous trees **16. G. brassicolens var. brassicolens**
9. Pileus pale reddish or pinkish brown, pallescent to almost white; on coniferous debris **16. G. brassicolens var. pallidus**
10. Stipe at least for most of its length smooth, polished (apex may be pruinose, base may be tomentose-strigose) 11.
10. Stipe fibrillose, fibrillose-striate, pruinose, hairy or tomentose over most of its length 20.
11. Stipe fairly dark grey-brown or red-brown over its whole length, base often blackish brown 12.
11. Stipe, at least in most of its length yellow, yellow-brown, orange-grey or orange-brown, except sometimes for the red-brown base 14.
12. Basidiocarps growing in dense bundles of many specimens together from a common base; pileipellis a cutis or thin ixocutis of rather simple, cylindrical hyphae **10. G. acervatus**
12. Basidiocarps growing single, in groups or in small clusters, but then pileipellis with distinct Dryophila-structure 13.
13. Pileus dark red-brown at centre, much paler yellow-brown to yellow-red towards margin; lamellae pale cream-coloured; caulocystidia absent; pileipellis with well-developed Dryophila-structure; hyphae of trama not turning green in alkali; in deciduous woods (*Fagus*, *Quercus*) **24. G. erythropus**
13. Pileus chocolate-brown, paler at outermost margin only; lamellae pale brown to isabella grey; caulocystidia sparse to numerous; pileipellis with poorly developed Dryophila-structure; hyphae of trama turning green in alkali; in alpine habitat among *Leuseleuria procumbens* **27. G. loiseleurietorum**
14. Pileus not translucently striate or at margin only, uniformly pale to dark brown 15.
14. Pileus distinctly translucently striate, pale yellow, yellow, orange-brown, sometimes with darker centre 16.
15. Spores (4.6-)5.1-6.3 x 2.5-3.5(-4.0) µm; cheilocystidia 12-45 x 3.0-9.0 µm, irregularly cylindrical or clavate to spheropedunculate, with one or more short, finger-like apical projections; lamellae usually distinctly yellow, rarely white; pileipellis with well-developed Dryophila-structure. **19. G. ocior**
15. Spores (6.2-)6.5-8.5 x 3.0-4.4 µm, cheilocystidia 16.5-30(-44) x 6.0-11.5 µm, clavate to coralloid, often lobed with broad, blunt projections; lamellae white; pileipellis with poorly developed Dryophila-structure **21. G. alpinus**
16. Lamellae pale orange-grey, ochre-brown to brown in mature specimens 17.
16. Lamellae white, pale cream-coloured to when mature 19.

17. Pileipellis with distinct Dryophila-structure; cheilocystidia present, but inconspicuous, 18-26 x (3.1-)5.2-6.6 µm, clavate to cylindrical, irregular; in autumn in thermophilous *Quercus* forests **23. G. hybridus**
17. Pileipellis a cutis of inflated terminal elements with some lateral projections, but not forming a real Dryophila-structure; cheilocystidia absent 18.
18. Pileus uniformly red-brown when moist, stipe brown-red, pale than pileus; in spring in places where the snow just melted in boreal and mountainous habitats, occasionally also in alluvial forest in the lowlands **12a. G. nivalis** var. **nivalis**
18. Pileus and stipe very pale brown; on rotten wood from spring to late summer **12b. G. nivalis** var. **pallidus**
19. Cheilocystidia irregularly cylindrical or slightly clavate with one or more coralloid outgrowths; pileus with ochre-brown tinges, especially at centre, translucently striate up to half the radius; stipe more or less equal. **18. G. dryophilus**
19. Cheilocystidia clavate, usually without appendages or outgrowths; pileus pale yellow, usually without ochre or brown tinges, deeply translucently striate, almost to centre; stipe often with distinctly inflated basal part. **20. G. aquosus**
20. Pileus and stipe very dark red-brown to blackish brown; cheilocystidia absent or inconspicuous; hyphal walls, and often also encrustations on hyphae turning green in alkali **26. G. fuscopurpureus**
20. Basidiocarps paler, or if dark-coloured, then with well-differentiated cheilocystidia, and hyphal walls not turning green in alkali 21.
21. Basidiocarps growing fasciculate from a common base, few to many together; lamellae remarkably thin and crowded **2. G. confluens**
21. Basidiocarps growing single or fasciculate, but then lamellae normally spaced to distant 22.
22. Stipe fibrillose lengthwise, not markedly pruinose, hairy, floccose or strigose 23.
22. Stipe pruinose, hairy or strigose 24.
23. Basidiocarps rather robust with strongly fibrillose-striate stipe and many lamellae (L up to 200 or more); on compost heaps or wood-chips, summer and autumn **5. G. luxurians**
23. Basidiocarps small to medium-sized with finely fibrillose stipe and fewer lamellae; in spring on litter, near the melting snow **12. G. nivalis**
24. Basidiocarps reminiscent of *Marasmius oreades* with fairly pale yellowish to ochre-brown colours and pruinose stipe, which may become almost glabrous with age **11. G. oreadoides**
24. Basidiocarps different: darker coloured, and stipe usually hairy-tomentose to strigose, particularly in lower half 25.
25. Lamellae remarkable distant, pinkish or yellowish brown; stipe densely woolly-strigose with white to yellow hairs; taste acrid **3. G. peronatus**
25. Lamellae normally distant to crowded; stipe pruinose to hairy, rarely strigose; taste mild 26.
26. Lamella edge sterile with strongly inflated cheilocystidia, which usually have finger-like excrescencies in apical part; pileipellis with similar cystidia-like elements; on wood **4. G. inodorus**
26. Lamella edge fertile, heterogeneous or sterile, but then cheilocystidia less strongly inflated, and pileipellis different; usually in humus or on (coarse) litter 27.
27. Stipe white to greyish pruinose; cheilocystidia absent; lamellae fairly crowded; pileipellis a thin ixocutis **9. G. putillus**
27. Stipe with white, yellow, ochre or yellowish red tomentose, hairy or strigose covering; cheilocystidia present, although sometimes scattered and inconspicuous; lamellae normally spaced to fairly distant; pileipellis a cutis, sometimes with transitions to a trichoderm 28.
28. Pileipellis a distinct Dryophila-structure 29.

28. Pileipellis a cutis, sometimes with transitions to a trichoderm, made up of slightly to distinctly diverticulate elements 30.

29. Stipe (pale) brown; lamellae white to pale cream-coloured; cheilocystidia fusiform, cylindrical to clavate; in thermophilic *Quercus* forest, sometimes mixed with conifers (*Juniperus*, *Abies pinsapo*) **22. G. benoistii**

29. Stipe (dark) red-brown; lamellae pinkish cream to pinkish brown; cheilocystidia clavate with rostrate or lobed apex; in *Fagus* forest, rarely also found under *Quercus* **25. G. fagiphilus**

30. Spores small, (5.8-)6.6-9.0 x 3.2-4.2(-4.5) µm; cheilocystidia scattered; pileus (almost) glabrous when dry; pileipellis a cutis of 3.0-9.0 µm wide, cylindrical, radially oriented or interwoven hyphae, with smooth, hyaline or yellow, minutely incrusted walls, sometimes with finger-like projections (poorly developed Rameales-structure) **6. G. terginus**

30. Spores larger; cheilocystidia abundant; pileus rugulose to tomentose when dry; pileipellis with inflated terminal elements 31.

31. Spores 8.5-11.0 x 4.0-5.0 µm, E = 1.9-2.6, Q = 2.4, oblong to cylindrical, sometimes elongate-lacrymoid; stipe brown to red-brown **7. G. moseri**

31. Spores 6.5-11.5 x 3.5-5.5 µm, E = (1.4)1.5-1.9(-2.1), Q = 1.7, ellipsoid to oblong or sublacrymoid; stipe incarnate at apex, brown with violaceous tinge below **8. G. huijsmanii**

Gymnopus sect. Gymnopus

Agaricus tribus *Collybia* sect. *Striaepedes* Fr., Epicr.: 109. 1838; *Collybia* sect. *Striaepedes* (Fr.) Quél., Mém. Soc. Émul. Montbéliard 2(5): 92. 1872.; *Collybia* Sect. *Striipedes* (Fr.) Quél. emend. Clémençon, Z. Mykol. 47: 8. 1981.

Type species: *Gymnopus fusipes* (Bull.: Fr.) S.F. Gray.

Basidiocarps fleshy; stipe fusoid, deeply longitudinally striate to sulcate, forming a distinct pseudorrhiza; spore print white to pale ochraceous; spores non-dextrinoid; cheilocystidia present; pileipellis a transition between cutis and trichoderm, made up of inflated, irregular, often coralloid elements, similar to the Dryophila-structure, often slightly gelatinized.

Chemical reactions: no part of carpophores dextrinoid or cyanophilous.

Ecology: Parasitic or saprotrophic, in bundles at the base of broad-leaved trees, often on roots or stumps.

Distribution: So far only one European species known, but *Collybia sulcatipes* A.H.Smith from North America may also belong to this section.

Notes: In this monograph, the concept of sect. *Gymnopus* is adopted from CLÉMENÇON (1981, as *Striipedes*). SINGER (1975) and MOSER (1983) included here also species of *Rhodocollybia* (sect. *Maculatae* and *Butyraceae)*. However, those sections are characterized by dextrinoid spores and a different pileipellis structure.

1. Gymnopus fusipes (Bull.: Fr.) S. F. Gray

Pl. 5, Fig. 7

Agaricus fusipes Bull., Herb. France: pl. 516. 1791; *Agaricus fusipes* Bull.: Fr., Syst. mycol. 1: 120. 1821; *Collybia fusipes* (Bull.: Fr.) Quél., Mém. Soc. Émul. Montbéliard, sér. 2(5): 93. 1872 (Champ. Jura Vosges 1); *Rhodocollybia fusipes* (Bull.: Fr.) Romagn., Bull. trimest. Soc. mycol. Fr. 94: 78. 1978; *Gymnopus fusipes* (Bull.: Fr.) S.F. Gray, Nat. Arr. Brit. Plants 1: 604. 1821. - *Agaricus crassipes* Schaeff., Fung. Bavariae 4: 38. 1774; *Collybia crassipes* (Schaeff.) Ricken, Blätterpilze: 407. 1915. - *Agaricus fusiformis* Bull., Herb. France: pl. 76. 1781-1782. - *Agaricus daucipes* Pers., Mycol. eur. 3: 147. 1828. - *Agaricus lancipes* Fr., Epicr.: 63. 1838; *Collybia lancipes* (Fr.) Gillet, Hyménomycètes: 312. 1876. - *Agaricus illicinus* DC. in DC & Lam., Fl. franç. 5: 48. 1815; *Collybia illicina* (DC.) Gillet, Hyménomycètes: 313. 1876. - *Collybia oedematopoda* (Schaeff.) Sacc., Syll. Fung. 5: 206. 1887.

Misapplied: *Collybia contorta* (Bull: Fr.) Raith. sensu Jansen, Collybia: 45-48, fig. 14. 1991; Noordeloos in Bas et al, Fl. agar. neerl. 3: 119-120. 1995.

Excluded: *Collybia crassipes* s. Ricken, Blätterpilze: 2pl. 106, fig. 3. 1915; Clémençon, Z. Mykol. 47: 18. 1981; Moser, Kl. Kryptog.-Fl., 1. ed.: 56. 1953 (= unknown species); sensu Noordel., Fl. agar. neerl. 3: 114-115. 1995 (= *Gymnopus luxurians*).

Type specimen: not existing; iconotype: Bulliard, Herb. France: pl. 516. 1791. Type-locality: France. Epitype: France, Dept. L. & Ch, Montrichard, 19 Sept. 1955, O.F.Uffelie s.n. (L).

Selected icones: Breitenbach & Kränzlin, Pilze Schweiz 3: pl. 192. 1991; Bulliard, Herb. France: pl. 76 (as *A. fusiformis*), pl. 516, fig. 2 (iconotype). 1781-1791; Bresadola, Iconogr. mycol. 4: pl. 192. 1928; Cetto, Funghi Vero, Ed. 1, 1: pl. 106. 1970; Dähncke & Dähncke, 700 Pilze: 214. 1979; Hagara, Atlas Húb: 230-231. 1987; Lange J., Fl. agar. dan. 2: pl. 43D. 1936; Moser & Jülich, Farbatl. Basidiomyc. III *Collybia* 4. 1986; Romagnesi, Nouv. Atl. Champ. 2: pl. 106a. 1958; Romagnesi, Petit Atl. Champ. 1: pl. 198. 1962; Phillips, Mushr. other Fungi: 55. 1981.

Selected literature: Clémençon, Z. Mykol. 47: 19, fig. 2. 1981; Jansen, Collybia: 45-48, fig. 14. 1991 (as *C. contorta*); Malençon & Bertault, Fl. Champ. sup. Maroc. 2: 401. 1975; Noordeloos in Bas et al, Fl. agar. neerl. 3: 119-120. 1995 (as *C. contorta*).

Description: Pileus 30-90 mm broad, hemispherical, broadly conical to convex, expanding with age to broadly convex or plano-convex with low, broad umbo, with deflexed then straight or reflexed margin, hygrophanous, when moist translucently striate at margin only, dark red-brown or rusty brown (2.5 YR 3-4/4; K. & W. 7D7), paler at centre and usually spotted with rusty or yellowish spots, pallescent upon drying to reddish yellow (2.5 YR 5/6, 5 YR 5-6/6), glabrous, smooth to slightly rugulose, dull. Lamellae fairly distant, broadly adnate, sometimes somewhat emarginate, 4-8 mm broad, sometimes anastomosing, pale greyish brown, pale brown then dark brown or red-brown (10 YR 7/2, 5-6/3, 5 YR 5/6, 2.5 YR 3/2-4), often with small rusty spots, with entire, concolorous edge. Stipe 50-110(-160) x 8-20 mm, fusiform, or more or less cylindrical above and fusoid in lower part, usually irregularly compressed and curved or flexuous, solid or narrowly fistulose, concolorous with lamellae at apex, downwards dark reddish brown (10 YR 7/4, 5 YR 6/3), often with rust-coloured spots, strongly fibrillose-sulcate lengthwise, often twisted, glabrous or finely white-pruinose, dull or shining; at base originating from a root-like black sclerotium. Context whitish to sordid reddish. Smell indistinct, sometimes sweetish. Taste indistinct, fungoid. Spore print white, slightly turning yellowish on drying.

Pl. 5: *Gymnopus fusipes* (Photo: E. Skála)

Spores (4.5-)5.4-6.6(-7.7) x (2.9-)3.2-3.8(-4.5) µm, E = 1.3-1.9, Q = 1.7, ellipsoid to oblong, sometimes amygdaliform. Basidia 30-40 x 5.0-7.0 µm, 4-spored, narrowly clavate. Basidioles 11-34 x 2.1-6.2 µm, narrowly clavate, cylindrical clavate. Lamella edge heterogenous. Cheilocystidia sparse to abundant, 17-36 x 3.8-9.0 µm, clavate, narrowly clavate, with coralloid projections in upper part, thin-walled, hyaline. Pileipellis an ixocutis with transitions to an ixotrichoderm, made up of 2.5-10 µm broad, lobed elements with smooth or weakly incrusted walls, embedded in a 35-50 µm thick, gelatinous layer (similar to the Dryophila-structure). Pileitrama made up of cylindrical, hyaline, thin-walled, up to 7 µm wide hyphae. Stipitipellis a cutis of yellow-brown, cylindrical, 4-11 µm wide hyphae. Sometimes with sparse, hyaline, thin-walled, up to 7 x 1.5 µm large hyphal endings on surface. Clamp-connections abundant in all tissues.

Chemical reactions: no part of basidiocarp amyloid or dextrinoid.

Ecology: Saprotrophic or possible parasitic, solitary or in small clusters, usually deeply rooting and often originating from an irregular blackish sclerotium in and around roots and stumps of *Quercus*, rarely also found on *Betula, Castanea* or *Fagus* in deciduous forests, preferably on richer soil types.

Distribution: widespread, not uncommon in temperate parts of Europe.

Phenology: June to October

Collections examined:

AUSTRIA: St. Goar, 1883? G. Herpell (W); Siegendorf, 19 Sept. 1979, (WU); Hainburg, „Wolfsthal", 5 Sept. 1988, A. Hausknecht (WU); Wien, „Maurerwald", 30 Oct. 1979, (WU); Wien, „Lainzer Tiergarten", 21 June 1981, Simmonitsch (WU); ditto, 22 Aug. 1982, U. Passauer (W); Mannersdorf, „Brunnberg" in Leithagebirge, Sept. 1916, K. Keissler (W); Brodersdorf, 29 July 1911, P. Demelius (W). **BELGIUM:** prov. Namur, Ave-et-Auffe, 22 Aug. 1971, C. Bas 5621 (L); Briquemont, 7 Sept. 1975, exc. N.M.V. (L); Le Roptai, 9 Sept. 1973, A.E. Jansen 110 (L). **BULGARIA:** „Ropotamo", „Arkutino", 10 June 1970, J. Kuthan (BRA); ditto, 17 June 1971, J. Kuthan (BRA); ditto, 12 June 1976, J. Kuthan (PRM); Stara Planina, Rudnik, 5 June 1978, J. Kuthan (BRA). **CZECH REPUBLIC:** BOHEMIA: Třebenice, 30 Aug. 1975, J. Glück (PRM); Stará Hlína-Vitmanov, „Nový vdovec", 1 Sept. 1971, J. Kubička (PRM); Olešovice, 7 Aug. 1957, K. Kult (PRM); Těptín, 24 Aug. 1957, K. Kult (PRM); Praha-Nebušice, 25 Oct. 1942, O. Chyba (PRM); Praha, „Stromovka", Sept. 1946, B. Vošoust (PRM); Praha, „Kunratický les", July 1935, J. Herink (PRM); Praha-Klánovice, „Vidrholec", 28 June 1964, M. Svrček (PRM); Praha-Krč, 19 July 1968, V. Eckert (PRM); Praha, „Kinského sady", 17 July 1968, E. Wichanský (PRM); Černolice, Aug. 1953, A. Pilát (PRM); ditto, 15 Aug. 1957, A. Pilát (PRM); Kuřim near Čáslav, 15 Oct. 1950, Kňákal (PRM); Slaný, 1 Oct. 1934, B. Veselý (PRM); Nový Bydžov, Oct. 1942, Deyl (PRM); Karlštejn, 8 Sept. 1934, A. Pilát & Deyl (PRM); ditto, 18 Oct. 1938, J. Herink (PRM); ditto, 19 July 1942, O. Chyba (PRM); ditto, Oct. 1950, A. Pilát (PRM); Hlásná Třebáň, „Políčko", 18 July 1943, S. Havlena (PRM); Řitka, 21 July 1948, A. Pilát (PRM); Vodňany, „Černohájí", 27 July 1938, J. Herink (PRM); Zásmuky near Kolín, July 1946, J. Pačes (PRM); Liteň, „Mramor", 26 Aug. 1972, E. Dlouhý (PRM); Dvorce near Lysá n. Lab., 19 July 1968, J. Pinkas (PRM); České středohoří, „Lovoš", 13 Aug. 1958, M. Svrček (PRM). MORAVIA: Kobylí na Mor., „Ochozy", 12 June 1994, V. Antonín 94.50 (BRNM); Tvořihráz, 24 Aug. 1962, V. Pospíšil (BRNM); Stary Poddvorov, „Kapansko", 22 Aug. 1962, T. Čermák (BRNM); Veverská Bítýška, 27 July 1951, F. Šmarda (BRNM); ditto, „Doubrava", 14 Aug. 1956, K. Kříž (BRNM); Kuřim, „Šiberná", 12 Aug. 1951, F. Šmarda (BRNM); ditto, 1 Aug. 1952, F. Šmarda (BRNM); ditto, 27 July 1961, F. Šmarda (BRNM); Lesonice, „Lesonický háj", 5 July 1955, K. Kříž (BRNM); Milovice, 14 July 1954, F. Šmarda (BRNM); ditto, „Milovický les", 4 July 1993, J. Chytil (BRNM); Dolní Věstonice, „Děvičky", 5 Aug. 1954, F. Šmarda (BRNM); ditto, 2 July 1955, K. Kříž (BRNM); ditto, 19 Aug. 1955, F. Šmarda (BRNM); ditto, 5 Aug. 1956, K. Kříž (BRNM); Lelekovice, „Babí lom", 25 June 1948, F. Šmarda (BRNM); Kuřim, „Bělč", 20 June 1946, F. Šmarda (BRNM); ditto, 12 Sept. 1950, F. Šmarda (BRNM); ditto, 22 June 1952, F. Šmarda (BRNM); Grygov, „Království", 31 July 1963, B. Řihošek (BRNM); Čebín, „Čebínka", 19 Aug. 1939, F. Šmarda (BRNM); Malhostovice, „Zlobice", Aug. 1960, F. Šmarda (BRNM); Lísov, 5 July 1960, F. Šmarda (BRNM); ditto, 8 Aug. 1961, F. Šmarda (BRNM); Hluboké Mašůvky, 2 July 1960, F. Šmarda (BRNM); Křtiny, Arboretum, 2 Aug. 1982, A. Vágner (BRNM); Brno-Řečkovice, Aug. 1952, F. Šmarda (BRNM); Brno-Pisárky, 30 Aug. 1959, V. Pospíšil (BRNM); Brno-Líšeň, „Hády", 3 June 1963, K. Kříž (BRNM); Němčičky, „Nosperk", 10 July 1992, V. Antonín 92.35 (BRNM); Dřevohostice, „Dřevohostický les", 4 Sept. 1957, V. Pospíšil (BRNM); Brno-Pisárky, 24 Aug. 1904, E. Steidler (BRNM); ditto, „Myslivna", 12 Dec. 1965, E. & K. Rybníčkovi (BRNM); Brno-Bosonohy, „Bosonožský háj", 18 July 1970, K. Kříž (BRNM); ditto, 28 July 1979, J. Kubička (PRM); Brno-Jundrov, 20 Aug. 1962, A. Musil (BRNM); Brno-Medlánky, „Baba", 20 Aug. 1962, F. Valkoun (BRNM); Suchohrdly, „Purkrábka", 5 Aug. 1965, F. Šmarda (BRNM); Únanov, „Sv. Hubert", 18 Aug. 1965, F. Šmarda & K. Brychta (BRNM); Habrovany, „Líchy", 3 Oct. 1968, K. Kříž (BRNM); Náměšť na Hané, 22 Aug. 1962, B. Řihošek (BRNM); Želetice, 20 July 1968, K. Koncerová (BRNM); Hodonín /Göding/, „Hodonínský les" /Gödinger Wald/, Sept. 1923, J. Hruby (BRNM); Čížov, „Hardeggské skály", „Masarykova vyhlídka", 20 July 1988, Z. Pouzar & F. Kotlaba (PRM); Hranice na Mor. /Mähr.Weisskirchen/, Svrčov, July 1914, F. Petrak (W); ditto, Aug. 1922,

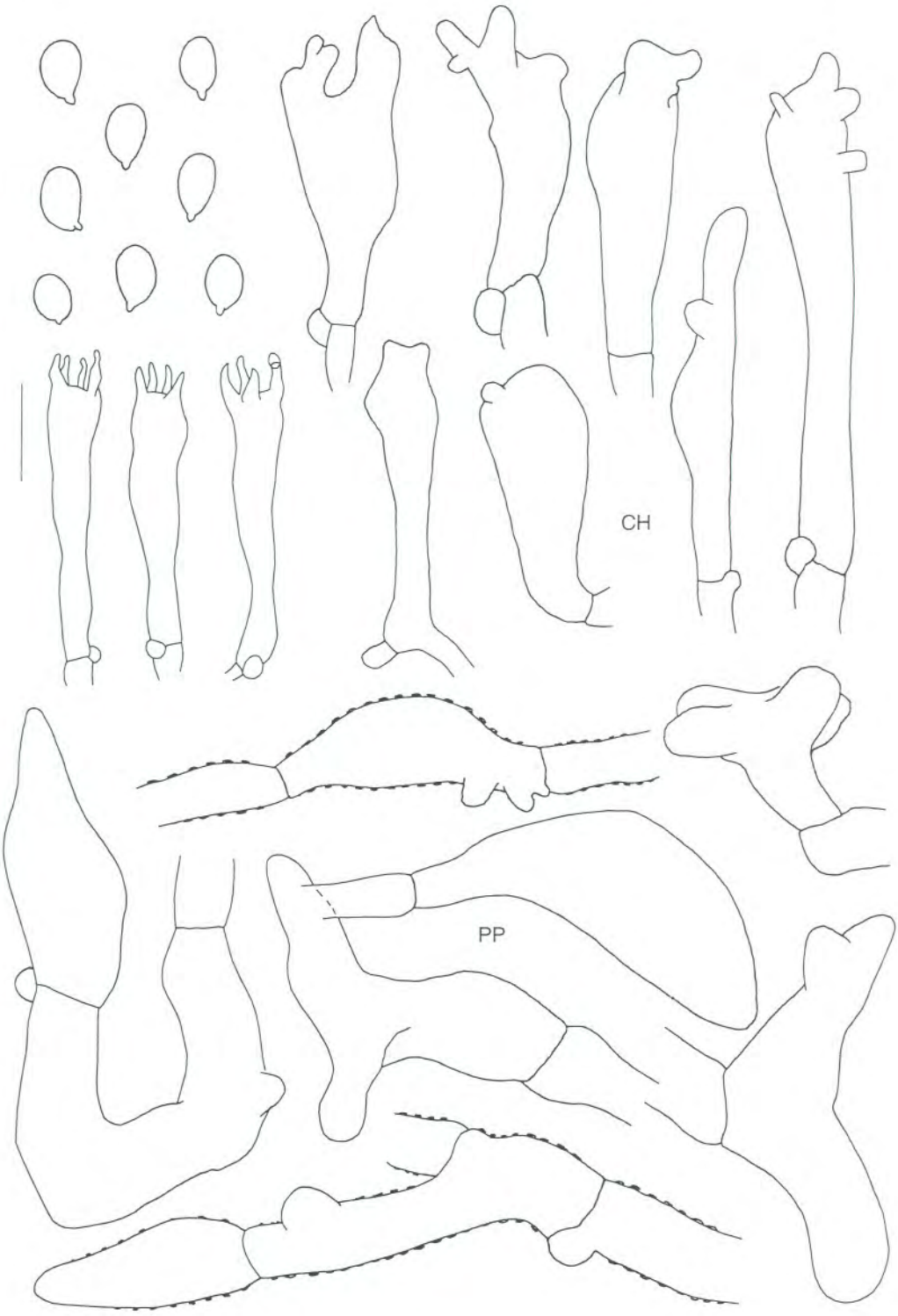

Fig. 7: *Gymnopus fusipes*. Bar = 10 µm.

F. Petrak (W); Hranice na Mor. /Mähr.Weisskirchen/, Podhoří /Podhorn/, Sept. 1920, F. Petrak (W); ditto, Sept. 1934, F. Petrak (W); Černotín, near „Bečva", Sept. 1934, F. Petrak (W); ditto, Sept. 1941, F. Petrak (W). **FRANCE:** Paris, „Bois de Boulogne", ex coll. Reichenbach fil. (W); L & Ch., Montrichard, 19 Sept. 1955, O.F.Uffelie (L, epitype). **ITALY:** Florencia, „Boboli", June 1880, U. Martelli (W); Trento, Calceranica, 7 Sept. 1996, M. E. Noordeloos 96108 (L). **NETHERLANDS:** prov. Drenthe, 2 Aug. 1967, E. Arnolds 315 (L); prov. Overijssel, Denekamp, Singraven, 14 Oct. 1961, J. v. Brummelen 1370 (L); Olst, 23 Sept. 1901, K. Ankersmit (L); Delden, Twickel, 18 Oct. 1964, E. Kits van Waveren (L); prov. Gelderland, Garderen, 11 Oct. 1975, P. v. Winden (L); Winterswijk, 19 Sept. 1975, A.E. Jansen & M.E. Noordeloos (L); Vierhouten, 1918, C. Cool, (L); Else, 23 Aug. 1980, M.E. Noordeloos 801177 (L); Rheden, 19 Aug. 1961, C. Bas 2362 (L); Putten, 1 Oct. 1961, R.A. Maas Geesteranus 13575 (L); Apeldoorn, Het Loo, 16 Sept. 1967, C. Bas 4910 (L); Epe, Sept. 1938, S. de Lit (L); prov. Utrecht, Baarn, 31 Aug. 1980, H. v. d. Aa 7503 (L); prov. Noord-Holland, Vogelenzang, 15 Oct. 1977, Swanenburg-de-Veye (L); 's-Gravenland, Boekesteijn, 23 Sept. 1955, J. Daams (L); Heemstede, 1 Nov. 1955, C. Bas (L); prov. Zuid Holland, Wassenaar, Meyendel, 5 Sept. 1937, Boetje-van-Ruijven (L); prov. Limburg, Griendsveen, 7 Aug. 1974, H. Visser; Wijlre, 12 Sept. 1974, Pieter Bernard Jansen (L). **ROMANIA:** Baneavu near Bucuresti, 1969, V. Kachyňová (PRM); Cluj, „Hoia", 11 Oct. 1954, G. Silaghi, in: Flora rom. exs., No. 2915 (W). **SLOVAKIA:** Šaca, 29 Sept. 1967, K. Kříž (BRNM); Hajnáčka, „Malom-hegy", 24 Aug. 1954, F. Kotlaba 19/57 (PRM); Bratislava-Dúbravka, 21 June 1994, M. Bičkoš (BRA); Bratislava /Pressburg/, K. Mergl (BRA); Kováčová, 23 July 1963, E. Končeková (BRA); Prenčov, „Čierne blatá", 3 July 1888, A. Kmeť (BRA); Prenčov, „Háj", 4 Aug. 1888, A. Kmeť (BRA); Kalinčiakovo, „Vápník", 15 June 1988, J. Kuthan (BRA); Dolné Krškany near Nitra, 2 July 1972, A. Horváthová (BRA); Zlatníky near Bánovce n. B., 11 July 1971, J. Kuthan (BRA); Timoradza near Bánovce n. B., 10 July 1971, J. Kuthan (BRA); Šutovce near Bojnice, 25 Aug. 1974, J. Kuthan (BRA); Bašany near Banská Štiavnica, 28 Aug. 1974, J. Kuthan (BRA); Stakčín, „Saligov", „Vršok", 24 Oct. 1991, J. Kuthan (BRA); Chľaba, 8 July 1984, L. Hagara (BRA); Bratislava, „Devínska Kobyla", 3 July 1966, J. Kollár (BRA); ditto, 7 Aug. 1966, J. Kollár (BRA); Starna, „Košická cesta", „Hubovo", 29 June 1982, L. Hagara (BRA); Mudroňovo, „Chrbát", 30 Sept. 1988, L. Hagara (BRA); Brhlovce, Kamenny Chotár, „Ladia", „Dolinky", 1 July 1984, L. Hagara (BRA); Kamenica n. Hronom, 15 Aug. 1985, L. Hagara (BRA); Štúrovo, 15 Aug. 1970, J. Kuthan (BRA); Čabradský Vrbovok, 15 June 1984, J. Kuthan (BRA); Rohožník, 4 June 1988, L. Hagara (BRA); Bratislava, „Tri duby", 19 June 1971, R. Volf (BRA); Kuchyňa, „Vývrať", 1977, P. Lizoň (BRA); Limbach, 11 July 1965, Tomeček (BRA); Červený Kameň, 11 Sept. 1966, J. Kollár (BRA); Pribeta, 6 Sept. 1972, E. Futó (BRA); Radošiná, 1 Aug. 1987, P. Škubla (BRA); Moravany nad Váhom, „Krahulčie vrchy", 20 July 1989, L. Hagara (BRA); Radošiná, „Plešina", 21 July 1989, L. Hagara (BRA); Dubodiel, 31 Aug. 1974, M. Horváth (BRA); Zamutov, 1 Sept. 1991, J. Terray (BRA); Vyhne, 24 June 1972, A. Horváthová (BRA); Tribeč, Jelenec, 30 June 1993, E. Lisická (BRA); ditto, „Gaštanica", 5 Oct. 1983, J. Kuthan (BRA); Kostolany pod Tríbečom, „Lysec", 21 July 1983, V. Antonín 83.64 (BRNM); Skýcov, 12 Sept. 1981, L. Hagara (BRA); Dubová, „Lindavský les", 9 Oct. 1988, L. Hagara (BRA); Kaluža, 19 July 1988, J. Humeňanský (BRA); Kopčany, 25 June 1972, A. Dermek (BRA); ditto, „Šraňk", 2 Oct. 1974, P. Lizoň & Vereš (BRA); Brodské, „Kadúbek", 7 Oct. 1973, A. Dermek (BRA); ditto, „Adamov", „Adamovské polesie", 7 Sept. 1985, P. Lizoň (BRA); Ladzany, „Háj", 20 Sept. 1984, O. Bošík (BRA). **SWEDEN:** Upland, Fundbo parish, „Hofgarden", Aug. 1938-1948, E. Aberg, in: Lundell & Nannfeldt, Fungi exs. suec., No. 1716 (PRM, W). **UKRAINE:** Trebushany, „Menchul", between rivers „Kuzy" and „Bredecel", Aug. 1934, A. Pilát (PRM); Tereshva, July 1932, A. Pilát (PRM). **UNITED KINGDOM:** England, Windsor Great Park, 10 Sept. 1992, RW 24915 (E); Oxfordshire, Bagley Wood, 15 Sept. 1969, E. Kits van Waveren (L); Surrey, Box Hill, 24 July 1973, D.A. Reid (E); Scotland: Perthshire, Pitlochry, 9 Sept. 1994, RW 17476 (E).

Notes: *Gymnopus fusipes* is characterized by the fusoid, rooting stipe, reddish brown colour in all parts, pileipellis similar to a Dryophila-structure, cheilocystidia with coralloid upper part and by growing on and around roots and stumps of deciduous trees. Therefore it is very easily distinguished and the descriptions in literature are very much alike. It has been considered related to the species of *Rhodocollybia* (section *Maculata*), but the pileipellis structure and white spore print definitely place it in *Gymnopus* where it, however, takes a somewhat isolated position in the monotypic section *Gymnopus*.

JANSEN (1991) and NOORDELOOS (1995) used the name *Collybia contorta* for this species. However, close examination of the iconotype and protologue caused us to conclude that *Agaricus contortus* is better considered a nomen dubium (See Excluded and insufficiently known taxa).

CAMPBELL (1939) studied the growth of the mycelium and basidiocarps of *G. fusipes* and concluded that the basidiocarps are formed either on the wood itself or originate from a mycelial body that grows out of the wood. He distinguished two types of these mycelial bodies: the first being root-like, 5-8 cm long, more or less carrot-like with the basidiocarps growing in a bundle out of the broadest part, and a more or less amorphous, sclerotium-like structure. These mycelial bodies received various names in literature: sclerotium, pseudorhiza, and pseudosclerotium. JANSEN (1991) used the name root-like sclerotium, referring to the form and function of this organ.